

WE CLAIM

1. A mobile internet protocol regional paging
network having a visited-domain mobility agent for
handling a regional registration of a mobile node
visiting a paging area,

the mobile node having an idle mode module for
periodically providing an idle mode request to the
visited-domain mobility agent containing information that
the mobile node is entering an idle mode so as to
deactivate one or more components for energy-saving
purposes and reduce active communication with the mobile
internet protocol regional paging network,

the mobile node negotiating a time slot based paging
scheme with the visited-domain mobility agent.

2. A mobile internet protocol regional paging
network according to claim 1, characterized in that

the time slot based paging scheme includes the
exchange of information about time slots used for paging
area advertisements by the visited-domain mobility agent,
a message for the mobile node to deduce its current
paging area, or a combination thereof.

3. A mobile internet protocol regional paging network according to claim 1, characterized in that time instant are expressed in relation to a current time of day, if the mobile node and the visited-domain agent have accurate and synchronized time of day clocks.

4. A mobile internet protocol regional paging network according to claim 1, characterized in that time instants are expressed in relation to some time instant that the mobile node and the visited-domain agent both know, including a time instant of periodic paging area advertisements.

5. A mobile internet protocol regional paging network according to claim 1, characterized in that the idle mode request contains parameters for negotiating time slot based paging with the visited-domain mobility agent.

6. A mobile internet protocol regional paging network according to claim 5, characterized in that one of the parameters is a paging slot interval parameter for time slot based paging support.

7. A mobile internet protocol regional paging network according to claim 1, characterized in that the visited-domain mobility agent has an idle mode reply extension module that provides an idle mode reply containing parameters that can be used to determine a time instant when the mobile node expects to be paged.

8. A mobile internet protocol regional paging network according to claim 7, characterized in that the parameters include a paging slot index parameter and a paging slot offset.

9. A mobile internet protocol regional paging network according to claim 1, characterized in that the visited-domain mobility agent has a visitor list module that responds to the idle mode request, modifies its visitor list to include the mobile node and maintains a paging state for the mobile node as an idle mode.

10. A mobile internet protocol regional paging network according to claim 1, characterized in that the mobile internet protocol regional paging network further comprises a leaf foreign agent for providing a paging area advertisement with a paging area ID extension containing information about the paging area the mobile node is visiting.

11. A mobile internet protocol regional paging network according to claim 10, characterized in that the paging area advertisement contains an advertisement interval extension that specifies a time interval between subsequent paging area advertisements.

12. A mobile internet protocol regional paging network according to claim 1, characterized in that the visited-domain mobility agent responds to a regional registration request from the mobile node and maintains the paging state for the mobile node as an active mode.

13. A mobile internet protocol regional paging network according to claim 1, characterized in that the visited-domain mobility agent responds to a packet from a corresponding node addressed to the mobile node by requesting the visited-domain agent of the paging area to page the mobile node.

14. A mobile internet protocol regional paging network according to claim 1, characterized in that the mobile node responds to a paging message containing an identifier of the mobile node and enters an active mode.

15. A mobile internet protocol regional paging network according to claim 1, characterized in that

the mobile node responds to a paging area advertisement having a paged mobile node address extension with a paging multicast address and enters an active mode.

16. A method for entering an idle mode in a mobile internet protocol regional paging network having a visited-domain mobility agent for handling a regional registration of a mobile node visiting a paging area, the mobile node having a plurality of components that consume energy when activated, characterized in that the method comprises the steps of:

periodically providing with the mobile node an idle mode request to the visited-domain mobility agent containing information that the mobile node is entering an idle mode so as to deactivate one or more components of the mobile node for energy-saving purposes and reduce active communication with the mobile internet protocol regional paging network; and

negotiating a time slot based paging scheme with the visited-domain mobility agent and agreeing on time slots used for paging area advertisements and paging within the paging area.

17. A method according to claim 16, characterized in that the method further comprises the steps of:

responding with the visited-domain mobility agent to the idle mode request from the mobile node;

5 modifying a visiting list to include the mobile node; and

maintaining a paging state for the mobile node as an idle mode.

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10 18. A mobile node for entering a mobile internet protocol regional paging network having a visited-domain mobility agent for handling a regional registration of the mobile node visiting a paging area, the mobile node comprising:

15 an idle mode module for periodically providing an idle mode request to the visited-domain mobility agent containing information that the mobile node is entering an idle mode so as to deactivate one or more components for energy-saving purposes and reduce active communication with the mobile internet protocol regional
20 paging network; and

a time slot paging module for negotiating time slot based paging with the visited-domain mobility agent.

19. A mobile node according to claim 18,
characterized in that

the time slot paging module negotiates a time slot
based paging scheme with the visited-domain mobility
5 agent and agrees on time slots used for paging area
advertisements and paging within the paging area.

20. A mobile node according to claim 18,
characterized in that

time instant are expressed in relation to a current
10 time of day, if the mobile node and the visited-domain
agent have accurate and synchronized time of day clocks.

21. A mobile node according to claim 18,
characterized in that

time instants are expressed in relation to some time
15 instant that the mobile node and the visited-domain agent
both know, including a time instant of periodic paging
area advertisements.

22. A mobile internet protocol regional paging
network according to claim 18, characterized in that

the idle mode request contains parameters for
20 negotiating time slot based paging with the visited-
domain mobility agent.

23. A visited-domain mobility agent for handling a regional registration of a mobile node visiting a paging area in a mobile internet protocol regional paging network,

5 the mobile node having an idle mode module for periodically providing an idle mode request to the visited-domain mobility agent containing information that the mobile node is entering an idle mode so as to deactivate one or more components for energy-saving
10 purposes and reduce active communication with the mobile internet protocol regional paging network,

the visited-domain mobility agent having an idle mode reply extension module for negotiating time slot based paging with a time slot paging module of the mobile
15 node.

24. A mobile internet protocol regional paging network according to claim 23, characterized in that

the visited-domain mobility agent negotiates a time slot based paging scheme with the mobile node and agrees
20 on time slots used for paging area advertisements and paging within the paging area.

25. A mobile internet protocol regional paging
network according to claim 23, characterized in that
time instant are expressed in relation to a current
time of day, if the mobile node and the visited-domain
agent have accurate and synchronized time of day clocks.

26. A mobile internet protocol regional paging
network according to claim 23, characterized in that
time instants are expressed in relation to some time
instant that the mobile node and the visited-domain agent
both know, including a time instant of periodic paging
area advertisements.